PROTECTIVE PROPERTY OF CONDUCTIVE POLYANILINE COATING DERIVED FROM ITS DISPERSION

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INTRODUCTION

Ever since Deberry and Viehback [1] reported the feasibility of using conducting polymers as possible protective coating for anti corrosive measures, the spent in identifying appropriate systems for this purpose has increased. Towards these goals, studies on Polyaniline [2], Polypyrrole [3], Polythiophene [4] have been documented. In our present study, we describe the possibility of using customized polyaniline dispersion (nanoparticle) as a protective coating for the first time, especially on Aluminium substrate.

EXPERIMENTAL

Dispersions of Polyaniline (PANi) (100-200 nm) were prepared by suspension polymerization technique based on the patented procedure evolved here [5], employing various steric stabilizers. Broadly, this consisted of a well-regulated addition of the monomer in the form of the corresponding salt in water to the solution containing the oxidant (a persulfate salt) and the mineral acid. The dispersion had chloride as the dopant ion.

The aluminium substrate was subjected to standard surface treatment procedures (Table I) prior to depositing the PANi coating by a dip coating process. The PANi coated panels were subjected to Polarization measurements using BAS 100A electrochemical analyzer (area of exposure = 1 cm^2) in a three electrode assembly using 3% NaCl as a probe medium with saturated Calomel electrode as the reference.

RESULTS AND DISCUSSION

All the PANi dispersions prepared were found to form a homogenous coating of thickness 8μm – 15μm.

A representative response of polarization studies for bare and PANi coated Al is shown in Fig. 1. The positive shift in $E_{corr.}$ supports the theory of ennobling of the metal surface as proposed by Wessling [6]. For all the PANi films prepared using various stabilizers (Fig. 2), this has been observed clearly, confirming the potentiality of this dispersion based PANi coating for anticorrosive measure. This is understandable from the fact that the mid point potential range over which PANi undergoes redox reaction (0.4 V Vs. SHE) is far more positive than the reduction potential of Al (-1.16V Vs. SHE).

Thus this study proves the potentiality of using PANi dispersion prepared by suspension polymerization as a corrosion resistant precursor.

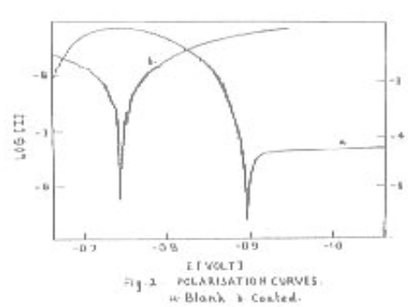

Fig. 1 POLARISATION CURVES
a- Blank b Coated.

Stabilizer Conc.	Anodized Al	10% NaOH 30% HNO_3,	5 gpl NaOH, 40 gpl NaF	50 gpl NaOH, 20 gpl $NaNO_2$
2% PVPd	0.3119	1.7765	3.2508	3.9903
1% PEO	0.4776	2.2504	4.6023	4.7765

TABLE I. Rate of Corrosion (MPY) of PANi coated Al for various Surface Treatments

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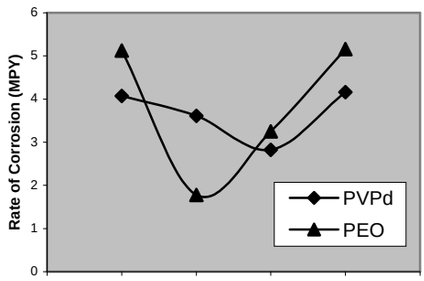

Fig. 2. Stabilizer Conc. Vs. Corrosion Rate

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